

Columbia River Mainstem Temperature TMDL Site Potential Temperature

Columbia River Regional Federal Executive Meeting
November 7, 2002

What is Site Potential?

“Site potential” is the temperature regime that the Columbia/Snake River main stems would have in the absence of human activity on the main stems. Site potential is the most reasonable approximation of the natural conditions of the river in the absence of human activity in the main stems that alters water temperature. It is an approximation because the stream flows and temperatures entering the main stems from upstream of the TMDL and from the tributaries are not natural.

State Water Quality Standards are based on temperature in the absence of human activity

The need for estimating site potential temperature arises from Oregon and Washington water quality standards for temperature.

- Oregon’s water quality standards, say “...no measurable surface water temperature increase resulting from anthropogenic activities is allowed....”
- Washington’s standards say “Temperature shall not exceed [specified criteria] due to human activities. When natural conditions exceed [the criteria], no temperature increases will be allowed which will raise the receiving water temperature by greater than 0.3 °C.”

Mathematical Modeling was Used to Estimate Site Potential

In order to apply the water quality standards of either state, it is necessary to estimate the temperature that would occur in the rivers in the absence of human activity. We have called this the site potential temperature. To estimate site potential temperature for this TMDL, a mathematical model was used to simulate the temperatures that would occur under the actual river flow and meteorological conditions that existed over the last 30 years, but with all the dams and point sources of heat removed.

Site Potential with the Dams in Place?

It has been suggested that site potential temperature should be estimated by simulating the temperatures that would occur in the main stems with the dams in place. That is the dams should be considered as part of the natural conditions and not as the result of human activity or anthropogenic activity. Such an estimation of site potential temperature would not be consistent with the water quality standards of Oregon and Washington.

- Oregon’s water quality standards define anthropogenic as: “‘anthropogenic’, when used to describe ‘sources’ or ‘warming’ means that which results from human activity.” There are no exceptions for dams or any other human activities.
- Washington’s standards define natural conditions as: “‘Natural conditions’ or ‘natural

background levels' means surface water quality that was present before any human caused pollution." Pollution is defined as: "'pollution' means such contamination, or other alteration of the physical, chemical, or biological properties, of any waters of the state, including change in temperature, taste, color, turbidity, or odor of the waters...." Washington, like Oregon has no exceptions for dams or any other human activities.

The water quality standards for temperature provide no discretion in terms of including or excluding particular types of human activity. However, **neither the state water quality standards nor the main stem TMDL require that the dams, or any other human activities must be removed from the rivers in order to meet water quality standards.**

State Implementation Plan is an Outcome for the TMDL to Move Toward Water Quality Improvements

The site potential temperature is used to aid in defining the target water temperatures for water quality improvements to occur. An implementation plan will need to be developed to determine if and how to achieve the water quality improvements. The plan should identify options for improving temperature and evaluate the feasibility of those measures. Here are some possible measures that are worthy of discussion and engagement:

- Realign water intakes in storage reservoirs to conserve cold water reserves until they are needed later in the year for cooling the river.
- Alter the flood control rule curves to make more water available later in the year.
- Work with Canada to determine if cool water reserves in Canadian storage reservoirs can be released to cool down-stream waters.
- Work with Idaho Power to determine if cool water from the Hells Canyon complex can be used to release cool water in the Snake River.
- Continue to refine decisions at Dworshak dam to ensure that the best decisions are made to improve water temperature in the Snake River.
- Identify steps that can be taken at individual dams to achieve the water quality standards at critical areas for salmon such as in fish ladders or juvenile holding and handling areas.
- Improve water temperature monitoring of the Columbia River system to further understand water temperature and water temperature improvements.

The implementation plan should determine if attainment of water quality standards is feasible. If attainment is not feasible, then the standards can be amended. The implementation plan should provide information on the level of water quality that is feasible to attain.

Use Attainability Analysis is a Possible Outcome

The water quality standards regulations provide for situations where dams preclude the attainment of water quality standards. At 40 CFR 131.10(g) the regulations say "States may remove a designated use which is not an existing use, as defined in Sec. 131.3, or establish sub-categories of a use if the state can demonstrate that attaining the designated use is not feasible because:(4) Dams, diversions or other types of hydrologic modifications preclude the attainment of the use, and it is not feasible to restore the water body to its original condition or to operate such modification in a way that would result in the attainment of the use."

The Malheur River in Oregon is an example of a river for which the state modified the uses because dams, reservoirs and diversions irrevocably changed the fish communities that the river could support.